Space Weather Forecast

Issued on Sunday, 09 June 2024 at 00:10 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Moderate (S2) solar radiation storm at first on day 1 (09 June), gradually reducing. Moderate geomagnetic storm (G2) likely in UTC day of Monday 10 June. Minor/Moderate (R1/R2) radio blackouts likely, risk easing into new UTC week.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Moderate during the last 24 hours, with occasional Moderate-class flares, peaking with a high end event from a complex sunspot region in the southwest at 08/0149UTC. This event generated a Coronal Mass Ejection (CME). MOSWOC Enlil modelling suggests a crossing time of Earth's orbit at 10/0600UTC, i.e. the start of the UTC day Monday 10 June. No other new CMEs were noted in the period.

There are currently up to ten sunspot regions on the Earth-facing side of the Sun. The apportionment for the far southeastern regions not yet clear, but an arriving region may now cover a significant span and is one to watch in the coming week. The most active region on the disc remains a large and complex group in the southwest, with this group showing gradual reconfiguration of its constituent parts. Other regions are smaller, magnetically simpler and either showing slight decay or little change in development.

Solar Wind / Geomagnetic Activity: Solar winds showed some lingering weak CME influence at the start of the 24-hour period, before perhaps transitioning into weak coronal hole influence. Solar wind speeds were predominantly slightly elevated, with occasional peaks into elevated levels. The number of particles similarly slightly elevated before undergoing a gradual waning. The magnetic field trace showed a brief early peak into Moderate levels, before gradually settling into Weak levels. The north-south component was variable between north and south orientation, with a similar trend from initial occasional Moderate variations, to Weakly variable.

The net result of the above solar wind measures was for a gradual reduction from Unsettled to Active (Kp 3 to 4) conditions, to Quiet (Kp 1 to 2).

Energetic Particles / Solar Radiation: Solar radiation levels showed a rapid rise in the wake of the large Moderate-class flare, with 10MeV protons rising to an eventual peak into Strong (S3) solar radiation storm levels at 08/0800UTC before gradually reducing through the Moderate (S2) solar radiation level. 100MeV protons also showed a rise to a peak of around 8pfu before these too followed a slow downward trend.

Four-Day Space Weather Forecast Summary
Solar Activity: Further Moderate-class flares are Likely, with an ongoing slight chance of Strong-class flares - these most probably from the sunspot regions in the far southeast and far southwest. The probabilities of both fall slightly by the very end of the four days as a result of the passing from the Earth-facing side of the westernmost of these groups.

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Solar Wind / Geomagnetic Activity: The CME associated with the 08/0149UTC Moderate-class flare shows an 'asymmetric halo' in its shock, and there is considered a risk of G2 moderate geomagnetic storm conditions on Monday 10 June. This is the only CME currently in the forecast.

Slightly elevated solar winds are expected on day 1 (09 June) from modest coronal hole fast wind influence. On day 2 (10 June) solar winds are likely to become elevated, perhaps strong, with the anticipated 08 June CME arrival. Winds will then gradually subside through days 3 and 4 (11 and 12 June).

Geomagnetic activity is expected to be Quiet to Unsettled on day 1 (09 June), perhaps with a slight chance of isolated Active conditions due to coronal hole fast wind influence. The arrival of 08 June CME is expected during the UTC morning of day 2 (10 June), with G2/Moderate geomagnetic storm conditions likely to develop for a time. Elevated geomagnetic activity may linger into the start of day 3 (11 June), before gradually waning to mainly Quiet by the end of the four-day period.

Energetic Particles / Solar Radiation: High energy proton flux should now show a very gradual waning tendency following its S3 Strong solar radiation storm peak, although proximity to this level means that any further suitable events from the western sunspot group may see level's rise once again. Moderate solar radiation S2 is therefore expected at first, with a slight chance of S3, falling to an expected minor S1 into Sunday 09 June. The risk should fall further to near background from Tuesday 11 June.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	70	30	1
Strong	G3	No	1	10	5	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	70	70	60	60
Very Active	R3 to R5 X	No	15	15	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	40	20	10
Very Active	≥ S3 *	Yes	20	5	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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